

The family Mitridae (Gastropoda) in the Lower Miocene Chipola Formation of northern Florida

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ABSTRACT

A brief review of the Mitridae from the Lower Miocene Chipola Formation of northern Florida is presented, with the description of two new species and the identification of adult specimens of *Mitra acteoglypha* Gardner, 1937. The new species are *Mitra calhounensis*, a common, large fusiform species that bears a resemblance to *Mitra fusiformis* (Brocchi, 1814) from the Miocene of Europe, and *Scabricola chipolana*, a rare, smooth-shell, species that is limited to the ancient reef environment along Tennile Creek and the Chipola River.

Additional key words: Neogene, *Mitra*, *Scabricola*, *Ziba*

INTRODUCTION

According to Cernohorsky (1976), the family Mitridae is characterized by "fusiform, elongate-ovate or cylindrical shells which have convex or angulate whorls, usually a narrow aperture, from 3 to 11 folds on the columella and a distinct siphonal notch." Members of this family are found in tropical to temperate waters throughout the world where they thrive in intertidal areas down to depths not exceeding 1465 m (Cernohorsky, 1976). The first fossil evidence of this family appeared in Upper Cretaceous deposits and numerous other fossil species have been collected and described from Tertiary deposits throughout the world (Cernohorsky, 1976).

Gardner (1937) reported 16 species of Mitridae from the Alum Bluff Group of Florida, "with probably as many more represented by material too imperfect to describe." Of the 16 Alum Bluff species, Gardner listed 11 from the Chipola Formation. Of these, eight are now classified in Costellariidae and one, *Mitra Pleioptygyna prodroma* Gardner, 1937, has been placed in the Pleioptygmatidae (Quinn, 1959). Currently, only *Ziba ilacidata* (Woodring, 1928) (= *Mitra mitrolita* Gardner, 1937) and *Mitra acteoglypha* Gardner, 1937 remain in the Mitridae.

The objectives of this paper are to: (1) describe two new species of Mitridae from the Chipola Formation of northern Florida and, (2) update the taxonomic status of the two remaining species from the Chipola Formation.

Type and figured specimens referred to in this paper are deposited in the paleontological collections at the

United States National Museum, Smithsonian Institution (USNM) and the Florida Museum of Natural History, University of Florida (UF).

SYSTEMATICS

Family Mitridae Swainson, 1831

Genus *Mitra* Lamarek, 1798

Subgenus *Mitra* Lamarek, 1798.

Mitra (Mitra) acteoglypha Gardner, 1937
(Figures 1–3)

Description: Shell fusiform-ovate, moderately heavy. Protoconch usually eroded. Sutures deeply impressed. Spire with 5 convex whorls sculptured with punctated, evenly spaced spiral grooves. Last whorl with 20–28 spiral grooves, penultimate whorl with 7–10, and remaining whorls with 6–7. Aperture narrow, more than half shell length. Outer lip thin, not lirate within. Parietal wall very thin. Columellar folds 4–5, sharply elevated, oblique, equally spaced, increasing in prominence in posterior direction. Anterior canal moderately long, not sharply defined, broadly emarginate at the extremity; anterior fasciole slightly swollen.

Material examined: UF 95999, length 11.3 mm, width 15.1 mm; UF 96000, length 13.9 mm, width 15.1 mm.

Type locality: USNM locality 2213, 1 mile below Bailey's Ferry, Chipola River, Calhoun County, Florida.

Distribution: *Mitra acteoglypha* is a moderately rare species that has been found at two Chipola Formation sites along Tennile Creek in Calhoun County, Florida, and at a single site along Farley Creek in Calhoun County. According to Vokes (1959), the sites along Tennile Creek probably represent an ancient reef environment while those at Farley Creek suggest a back-reef habitat.

Discussion: Gardner (1937) described *M. acteoglypha* from a single, broken, juvenile specimen (figure 1). Since the juvenile specimens of all three species of mitrids examined for this paper had spiral grooves similar to *M. acteoglypha*, it became necessary to obtain the type specimen and compare it to material from the Florida Museum of Natural History and the investigator's

collection in order to determine which of the adults bore the greatest similarity to the juvenile described by Gardner (1937). After careful comparison of the type with recently collected adult and juvenile specimens, it was apparent that the mitrid illustrated in figures 2-3 was the adult form of *M. acteoglypha*. This decision was based upon the fact that both had similar shell shapes, the whorls of both bear the punctated spiral sculpturing described by Gardner (*op. cit.*), and both had a similar number of columellar folds. The specimen illustrated in figure 2 is most similar to the holotype. Like the holotype, it has 5 columellar folds and nearly the same number of punctated spiral grooves on the last whorl (26 versus 25 in the holotype). The specimen in figure 3 has only four columellar folds and about 20 punctated spiral grooves on the last whorl. Further examination of 3 partially broken adult specimens in this investigator's collection revealed that all had 4 columellar folds.

Among New World fossil mitrids only the Miocene *Mitra almagrensis coralliophila* Olsson, 1922, from northern Peru, bears some resemblance to *M. acteoglypha*. Olsson (1922) described *M. coralliophila* as a shell sculptured with slightly elevated spiral cords separated by finely sculptured grooves. In *M. coralliophila* there is a total of five spiral cords on each of the whorls except for the last, and the columella bears 3 prominent folds. *Mitra acteoglypha* differs from *M. coralliophila* by its larger size (41.3 mm and 43.9 mm for the adults versus 17 mm), larger number of spiral cords (10 versus 5), and its larger number of columellar folds (4-5 vs. 3).

Because of strong similarities between these two species, Cernohorsky (1976) believed that *M. acteoglypha* might be related to the recent *Mitra barbadensis* (Gmelin, 1791). However, *M. barbadensis* entirely lacks the punctated spiral grooves that characterize *M. acteoglypha*. Among extant species, *M. acteoglypha* seems to bear a stronger resemblance to the Indo-Pacific *Mitra ambigua* Swainson, 1829. A comparison of these two species shows similar shell morphologies, with shells of the two species showing punctated spiral grooves. However, *M. acteoglypha* is a smaller species (43.9 mm length vs. 53.4 mm) with fewer columellar folds (4-5 vs. 5-6) and a fewer number of punctated spiral grooves (20-25 vs. 25-35).

Subgenus *Fusimitra* Conrad, 1855

Mitra (*Fusimitra*) *calhouensis* new species

(Figures 1-5)

Description: Shell slender, large, moderately heavy, fusiform-ovate. Protoconch usually eroded. Suture deeply impressed. Spire with 8-9 weakly convex whorls. First six teleconch whorls sculptured with 7-8, evenly spaced, pitted spiral grooves. Pitted spiral sculpturing on remaining teleconch whorls faint, disappearing near the aperture. Aperture slightly shorter than spire, narrow and elongate, smooth within. Columella with thin callus in adult specimens and 5-6 strong, oblique, equally

spaced folds. Siphonal fasciole straight, siphonal notch distinct.

Holotype: UF 95995, length 92.1 mm, width 24.3 mm.

Paratypes: Paratype A, UF 57754, incomplete specimen, length 60.5 mm, width 18.3 mm, Chipola Formation, north bank of Tennile Creek at powerline crossing about one mile west-northwest of mouth of creek at "Bailey's Ferry" (SE 1/4 Sec. 12, T1N, R10W), Calhoun County, Florida (Tulane University locality TU 530). Paratype B, UF 59579, incomplete specimen, length 62.0 mm, width 20.8 mm. From type locality.

Type locality: Chipola Formation, Tennile Creek, about 1.75 miles west of Chipola River (NE 1/4 Sec. 12, T1N, R10W), Calhoun County, Florida (Tulane University locality TU 546; = USGS 2212, "one mile west of Bailey's Ferry").

Distribution: Only one complete specimen of *M. calhouensis* is known. However, numerous fragments of this shell are present in the Tulane University Collection, now housed at the Florida Museum of Natural History, Gainesville. In addition, the investigator has obtained numerous shell fragments over the last ten years from a broad range of Chipola Formation collecting sites along Tennile and Farley creeks and both banks of the Chipola River.

Etymology: Named after Calhoun County, Florida.

Discussion: From the examination of numerous shell fragments it is evident that *M. calhouensis* attained a very large size with many specimens reaching total lengths in excess of 110 mm. In general shell shape and size of this species bears a strong resemblance to the living Mediterranean *Mitra fusiformis zonata* Marryat, 1818, and its fossil counterpart *Mitra fusiformis fusiformis* (Brocchi, 1814) from the Miocene and Pliocene deposits of Portugal, France, Italy, Austria, Hungary, Poland, England, and the Island of Rhodes. It is very likely that *M. fusiformis* and *M. zonata* share a common ancestor with *M. calhouensis*.

Mitra fusiformis can be distinguished from *M. calhouensis* by the more slender shell and presence of well-developed pitted spiral grooves on the first five teleconch whorls of the latter species. Among New World Neogene species, *M. calhouensis* bears some resemblance to *Mitra titan* (Gabb, 1873) from the Pliocene deposits of the Dominican Republic as well as the Late-Pliocene species, *Mitra woodringi* Olsson, 1964, from the Esmeraldas Formation of Ecuador, and *Mitra swainsonii dumberi* Olsson, 1932, from the Pliocene Tumbes Formation of northern Peru. Both *M. titan* and *M. calhouensis* are fusiform-elongate shells reaching lengths in excess of 110 mm with the early teleconch whorls having distinct spiral sculpturing. However, *M. calhouensis* has a thinner lip and has 5-6 columellar folds. In addition, the spiral sculpture on the early whorls of *M. titan* has fine spiral grooves with every

fourth one deeper (Pilsbry, 1922), while in *M. calhouensis* the spiral grooves are all the same depth on the early whorls.

Mitra swainsonii dunbari and *M. woodringi* are very similar and may represent the same species. This similarity was noted by Cernohorsky (1976), who considered *M. woodringi* to be conspecific with *M. swainsonii dunbari*. Abbott (1974) also listed *M. woodringi* as a synonym of *Mitra swainsonii swainsonii* (Broderip, 1836), an uncommon Recent "subspecies" that lives in deep water from South Carolina to the West Indies. *Mitra calhouensis* is similar to *M. woodringi* and *M. swainsonii dunbari* in that it is a fusiform-elongate shell with distinct spiral sculpturing on the early whorls. However, unlike the latter, *M. calhouensis* has a less stout and twisted anterior canal, it has 5–6 columnellar folds, and has fewer spiral grooves on the apical whorls.

Among extant taxa, *M. calhouensis* is also similar to *Mitra swainsonii antillensis* Dall, 1889. Cernohorsky (1976) listed this as a deep-water subspecies that occurs from North Carolina to Yucatan and the Antilles. Like *M. calhouensis*, *M. swainsonii antillensis* has 5–6 columnellar folds and has well-developed spiral sculpture. However, *M. calhouensis* has a more slender shell shape, more deeply impressed sutures, fewer spiral grooves, and the spiral sculpturing disappears near the aperture. It is possible that *M. calhouensis* is the fossil ancestor to the present day *M. swainsonii* complex from the Caribbean province.

New World ancestors to the fusiform-shaped *M. calhouensis* date back to the Cretaceous. These include *Paleofusimitra elongata* Sohl, 1963, from the Cretaceous Ripley Formation of Mississippi (Sohl, 1964), *Fusimitra millingtoni* (Conrad in Wailes, 1854) from the Eocene Moody's Branch Formation in Mississippi (Dockery, 1977) and *Mitra conquisita* Conrad, 1885 from the Lower Oligocene of the Vicksburg Group in Mississippi (MacNeil and Dockery, 1984).

Subfamily Imbricariinae Troschel, 1867

Genus *Ziba* H. and A. Adams, 1853

Ziba illacidata (Woodring, 1928)

(Figures 6–7)

Mitra (Tiara) henckeni illacidata Woodring, 1928, pp. 243, pl. 14, fig. 13 ("Miocene" [Late Pliocene] Bowden Formation, Jamaica);

Mitra (Tiara) mitrodita Gardner, 1937, pp. 408–409, pl. 48, figs. 10–11 ("1 mile below Bailey's Ferry, Chipola River, Calhoun County, Fla.");

Description: Shell fusiform, moderately slender. Protoconch glossy, with 3 whorls. Sutures deeply impressed. Teleconch whorls 7, convex, sculptured with strong spiral cords and axial threads. Four spiral cords on the spire whorls. Aperture narrowly lobate, about half shell length. Outer lip thin, the margin crenate in harmony with the external sculpture. Parietal wall thinly glazed. Columnellar folds 3, oblique, equally spaced, posterior fold more highly elevated. Siphonal notch narrow, deep.

Holotype: USNM 369433, length 10 mm, width 6.7 mm.

Type locality: Late Pliocene Bowden Formation, Jamaica.

Distribution: Bowden Formation in Jamaica and Chipola Formation sites along Tennile Creek, Farley Creek, and the Chipola River in northern Florida.

Remarks: *Ziba illacidata* belongs to a group of moderately small mitrids that are sculptured with a presutural carina, spiral grooves or cords and axial lirae in the interspaces. Cernohorsky (1991) tentatively placed mitrids with these characteristics in the separate genus *Ziba* until the radula of living species could be examined and compared with those belonging to the genus *Cancellula*.

Ziba illacidata was described by Woodring (1928) from the Late-Pliocene Bowden Formation of Jamaica. Later Gardner (1937) found a similar species in the early Miocene Chipola Formation deposits of northern Florida and named it *Mitra mitrodita* (Cernohorsky, 1991). After examining both *Mitra illacidata* and *Mitra mitrodita* stated that both shells are identical and, irrespective of the age difference, listed *M. mitrodita* in the synonymy of the geologically younger *M. illacidata*. This arrangement is followed herein and, for comparison purposes, the holotypes of *M. illacidata* and *M. mitrodita* are illustrated in figures 6–7.

Genus *Scabricola* Swainson, 1810

Subgenus *Swainsonia* H. and A. Adams, 1853

Scabricola (Swainsonia) chipolana new species

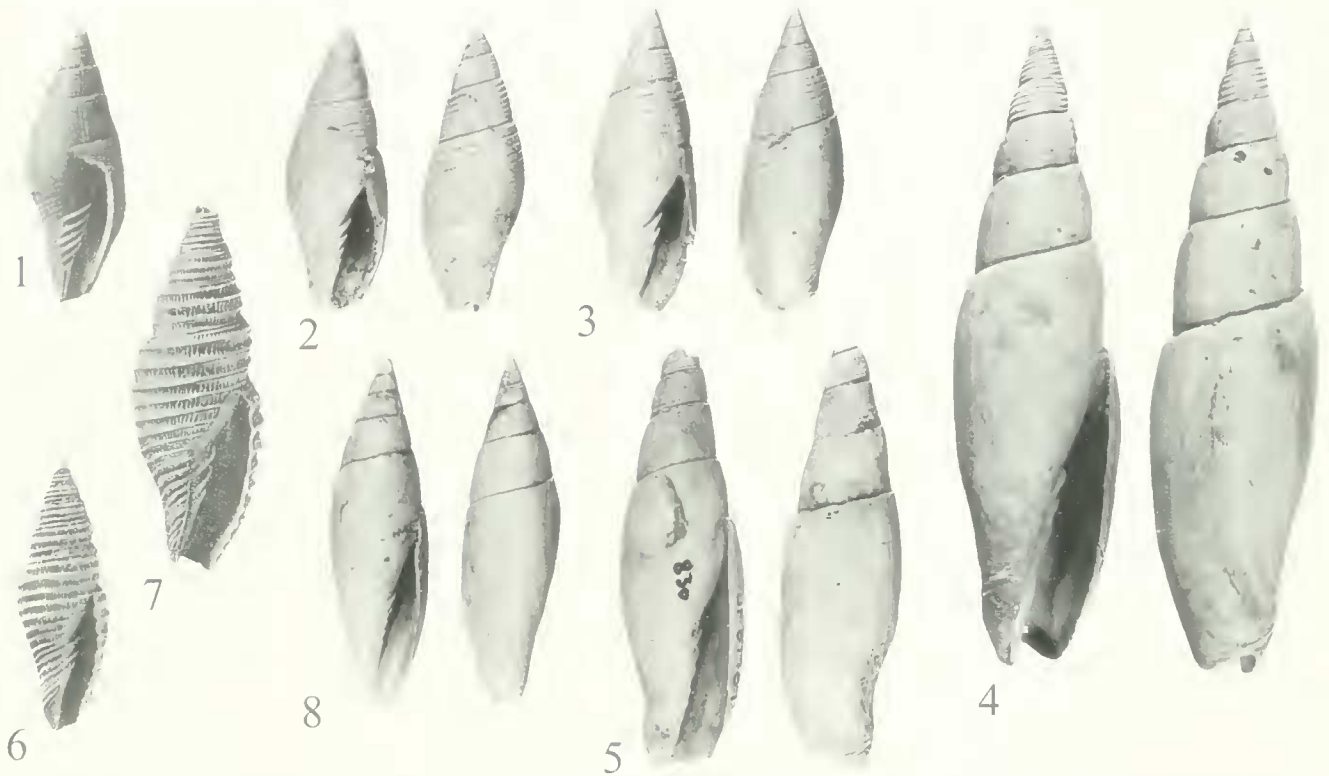
(Figure 8)

Description: Shell fusiform-elongate, moderately solid. Protoconch eroded. Suture distinct, impressed. Teleconch whorls 7, weakly convex, sculptured with 7–8 pitted spiral grooves on the early whorls. Spiral grooves very faint or absent on the penultimate and last whorl. Aperture half the length of the spire, elongate, fairly narrow and smooth within. Outer lip thin, outer edge smooth. Columnella with thin callus, callus more prominent anteriorly. Columnellar folds 4–5, moderately strong, oblique, equally spaced and of equal size. Siphonal fasciole straight or slightly recurved, siphonal notch prominent.

Holotype: UF 95997, length 50.2 mm, width 14.7 mm.

Type locality: Chipola Formation, Tennile Creek, about 1.25 miles west of Chipola River (SE 1/4 Sec. 12, T1N, R10W), Calhoun County, Florida (Tulane University locality TU 951).

Distribution: *Scabricola chipolana* is a very rare species that has only been collected from two localities along Tennile Creek and a single location along the Chipola River. The two sites along Tennile Creek are sep-



Figures 1–8. Mitridae from the Lower Miocene Chipola Formation, Florida. **1–3.** *Mitra (Mitra) acteoglypha* Gardner, 1937. Holotype USNM 114325, length 19 mm, width 7.0 mm (Photograph of illustration in Gardner, 1937; pl. XIXIII, fig. 5). **2.** Selected specimen, UF 95999; length 41.3 mm, width 15.1 mm. **3.** Selected specimen, UF 96000; length 43.9 mm, width 15.1 mm. **4–5.** *Mitra (Fusimitra) calhounensis* new species. **4.** Holotype, UF 95988, length 92.1 mm, width 24.3 mm. **5.** Paratype A, UF 57784, length 60.5 mm (incomplete specimen), width 15.3 mm. **6–7.** *Ziba illicidata* (Woodring, 1928). **6.** Holotype, USNM 369433, length 10 mm, width 6.7 mm (illustration from Woodring (1928) pl. 14, fig. 13). **7.** USNM 371435, holotype of *Mitra mitrodita* Gardner, 1937, length 27 mm, width 8.5 mm (illustration from Gardner, 1937; pl. 45, fig. 10). **8.** *Scabricola (Swainsonia) chipolana* new species. Holotype, UF 95997, length 50.2 mm, width 14.7 mm.

arated by approximately a half mile, and located on opposite sides of the creek.

Etymology: Named for the Chipola River in northern Florida.

Discussion: *Scabricola chipolana* is only known from one complete and two badly broken specimens. It is less bulbous and lacks the pronounced spiral sculpture characteristic of *Mitra acteoglypha* Gardner (1937), and is much smaller and more slender than *Mitra calhounensis*. The distinctive shell shape of *S. chipolana* rendered generic allocation difficult. An initial review of fossil and extant New World mitrids by this investigator revealed that *S. chipolana* was not compatible with any known species. However, a comparison of this shell with Indo-Pacific species showed that its shell features were most similar to those in the genus *Scabricola*. Members of this genus reach a length of 60 mm, have 5 S convex or subangulate whorls, are sculptured with deep, punctated, or striated grooves, have an aperture that is equal in length or longer than the space a collumella with 6–8 oblique folds, and have a distinct siphonial notch. *Scabricola chipolana* was assigned to the subgenus *Swainsonia*

because of its slender and smoother appearance and the punctated spiral sculpture was confined to the early spire whorls. Among extant Indo-Pacific species *S. scabricola* bears some resemblance to the shallow-water, sand-dwelling subspecies *Scabricola (Swainsonia) casta* (Gmelin, 1791). However, *S. casta* has a stouter shell shape, fewer punctated spiral grooves on the early spire whorls (3 vs. 7), fewer columellar folds (4–5 vs. 5–6), and its columellar folds are situated more toward the anterior end. *Scabricola chipolana* is the first and only known example of this genus from the New World. Only one fossil example of this genus, *Scabricola (Scabricola) desertangii* (Kiener, 1838), has been reported from the Pliocene of the Indo-Pacific (Cernohorsky, 1991), and there are no known fossil representatives of the subgenus *Swainsonia*.

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